



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/561,495

06/16/2006

David Alexander Gaukroger

FRYHP0137US

9316

23908 7590 06/27/2008
RENNER OTTO BOISSELLE & SKLAR, LLP
1621 EUCLID AVENUE
NINETEENTH FLOOR
CLEVELAND, OH 44115

EXAMINER

RUSH, ERIC

ART UNIT

PAPER NUMBER

2624

MAIL DATE

DELIVERY MODE

06/27/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/561,495	Applicant(s) GAUKROGER, DAVID ALEXANDER	
	Examiner Eric Rush	Art Unit 2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 December 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-45 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7, 9-30 and 32-45 is/are rejected.
- 7) ☒ Claim(s) 8 and 31 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 December 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>6/16/2006</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-2, 6, 9, 23-25, 29, and 32 are rejected under 35 U.S.C. 102(b) as being anticipated by Schanz U.S. Patent No. 6,810,138.

- With regards to claims 1 and 24, Schanz teaches an inspection system and method for inspecting deposits printed on workpieces through a printing screen, the system comprising: a camera unit movable relative to a printing screen, (Schanz, Column 5 Lines 13 – 40 and Lines 49 - 67) where comprising a body including a plurality of apertures, (Schanz, Column 6 Lines 1 - 23) and a workpiece on which deposits are printed through the apertures of the printing screen; (Schanz, Column 5 Lines 13 – 16 and Lines 57 - 65) and a control unit operable to control the camera unit such as to capture images of at least one pair of corresponding regions of the printing screen and the workpiece, (Schanz, Column 6 Lines 1 - 48) and process the images to determine, for each of a plurality of points defining the image of the printing screen, whether the point is of aperture, (Schanz, Column 6 Lines 1 - 24) and, where the point is of

aperture, determine whether the corresponding point of the corresponding image of the workpiece, as defined by a corresponding plurality of points, is of deposit, (Schanz, Column 6 Lines 25 – 48) thereby enabling a determination of a print characteristic of deposits printed on the workpiece from a relationship of the points determined to be of deposit to the points determined to be of aperture. (Schanz, Column 6 Lines 36 - 56)

- With regards to claims 2 and 25, Schanz teaches the system and method of claims 1 and 24, wherein the camera unit is operable simultaneously to capture images the printing screen and the workpiece. (Schanz, Column 6 Lines 1 – 48, Schanz teaches a camera unit consisting of two image sensors, Elements 11 and 12, which are operable to capture images simultaneously)
- With regards to claims 6 and 29, Schanz teaches the system and method of claims 1 and 24, wherein the control unit is configured to process the captured images subsequent to acquisition. (Schanz, Column 6 Lines 36 – 48, It is implicit that the images are processed after being acquired)
- With regards to claims 9 and 32, Schanz teaches the system and method of claims 1 and 24, wherein the images of the printing screen and the workpiece are pixelated images, with the points defining each of the

images being pixels of the pixelated images. (Schanz, Column 6 Lines 13 - 24)

- With regards to claim 23, Schanz teaches a screen printing machine incorporating the inspection system of claim 1. (Schanz, Fig. 1 Abstract, Column 5 Lines 12 – 20)

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

5. Claims 3, 5, 26, and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schanz U.S. Patent No. 6,810,138.

- With regards to claims 3 and 26, Schanz teaches the system and method of claims 1 and 24. Schanz teaches the use of image recording sensors to generate a pixel structure corresponding to an image. Schanz do not expressly teach wherein the camera unit is a full-area camera unit for capturing full-area images of the printing screen and the workpiece. However, the Examiner takes Official Notice of the fact that it is well known in the art to utilize full-area images to inspect workpieces. This modification would have been prompted in order to quickly accept an entire workpiece or reject an entire workpiece exhibiting defects.

- With regards to claims 5 and 28, Schanz teaches the system and method of claims 1 and 24. Schanz teaches the processing of images of the aperture and workpiece. Schanz does not expressly teach wherein the control unit is configured simultaneously to process the images of the printing screen and the workpiece during image capture by the camera unit. However, the Examiner takes Official Notice of the fact that simultaneous processing of the two corresponding images for comparison is notoriously well-known in the art. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the teachings of Schanz to simultaneously processes the images in order to decrease the amount of information being held in static memory locations.

6. Claims 4, 7, 10 – 22 and 27, 30, and 33 – 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schanz U.S. Patent No. 6,810,138 as applied to claim 1 above, and further in view of MacFarlane et al. U.S. Patent No. 4,578,810.

- With regards to claims 4 and 27, Schanz teaches the system and method of claims 1 and 24. Schanz is silent to the fact wherein the camera unit is a line-scan camera unit for capturing line-scan images of the printing screen and the workpiece. MacFarlane et al. teach wherein the camera unit is a line-scan camera unit for capturing line-scan images of the printing screen and the workpiece. (MacFarlane et al., Figs. 1, 2, & 3, Column 6 Lines 19 - 41) It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the teachings of Schanz with the teachings of MacFarlane et al. This modification would have been prompted in order to allow for a more consistent approach in analyzing workpieces that are moving with respect to the image capture device.
- With regards to claims 7 and 30, Schanz teaches the system and method of claims 1 and 24. Schanz fails to teach wherein the images of the printing screen and the workpiece are defined by respective ones of screen and workpiece signals having intensities in dependence upon the imaged features, with the points defining each of the images being time-

sliced components of the respective screen and workpiece signals.

MacFarlane et al. teach wherein the images of the printing screen and the workpiece are defined by respective ones of screen and workpiece signals having intensities in dependence upon the imaged features, (MacFarlane et al., Column 4 Lines 46 - 64) with the points defining each of the images being time-sliced components of the respective screen and workpiece signals. (MacFarlane et al., Figs. 1 - 3, Column 5 Lines 3 - 39) It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the teachings of Schanz in view of MacFarlane et al. This modification would have been prompted in order to allow for sequential imaging and inspection of workpieces as well as eliminate uncertainties in determining whether a point is of aperture or workpiece.

- With regards to claims 10 and 33, Schanz teaches the system and method of claims 9 and 32. Schanz fails to teach wherein the relationship of the points determined to be of deposit to the points determined to be of aperture is determined from a number count of the number of pixels determined to be of deposit relative to the number of pixels determined to be of aperture. MacFarlane et al. teach wherein the relationship of the points determined to be of deposit to the points determined to be of aperture is determined from a number count of the number of pixels determined to be of deposit relative to the number of pixels determined to

be of aperture. (MacFarlane et al., Fig. 3, Column 4 Lines 46 – 64, Column 13 Line 15 – Column 14 Line 13) It would have been obvious to one of ordinary skill in the art to modify the teachings of Schanz with the teachings of MacFarlane et al. This modification would have been prompted in order to inspect workpieces wherein the images have been thresholded, i.e. set to a '1' or a '0'.

- With regards to claims 11 and 34, Schanz teaches the system and method of claims 9 and 32. Schanz fails to teach wherein the control unit is configured to acquire a plurality of pairs of corresponding images of the printing screen and the workpiece in accordance with an inspection schedule defining a plurality of inspection sites at which images are in use acquired. MacFarlane et al. teach wherein the control unit is configured to acquire a plurality of pairs of corresponding images of the printing screen and the workpiece in accordance with an inspection schedule defining a plurality of inspection sites at which images are in use acquired. (MacFarlane et al., Column 5 Line 33 – Column 6 Line 41) It would have been obvious to one of ordinary skill in the art to modify the teachings of Schanz with the teachings of MacFarlane et al. This modification would have been prompted in order to inspect large areas without a loss in processing speed.

- With regards to claims 12 and 35, Schanz in view of MacFarlane et al. teach the system and method of claims 11 and 34. Schanz fail to teach wherein the inspection sites of the inspection schedule are determined in a set-up routine. MacFarlane et al. teach wherein the inspection sites of the inspection schedule are determined in a set-up routine. (MacFarlane et al., Column 5 Line 33 – Column 6 Line 41) It would have been obvious to one of ordinary skill in the art to modify the combined teachings of Schanz in view of MacFarlane et al. with further teachings of MacFarlane et al. This modification would have been prompted in order to allow for a more consistent, registered, approach in analyzing workpieces that are moving with respect to the image capture device.

- With regards to claims 13 and 36, Schanz in view of MacFarlane et al. teach the system and method of claims 12 and 35. Schanz fails to teach wherein an offset in the corresponding pair of images of the printing screen and the workpiece as acquired by the camera unit at each inspection site is predetermined, such that the pixel in an image of the workpiece corresponding to a pixel in the corresponding image of the printing screen is determined in accordance with the offset. MacFarlane et al. teach wherein an offset in the corresponding pair of images of the printing screen and the workpiece as acquired by the camera unit at each inspection site is predetermined, such that the pixel in an image of the

workpiece corresponding to a pixel in the corresponding image of the printing screen is determined in accordance with the offset. (MacFarlane et al., Column 5 Line 33 – Column 6 Line 41)

- With regards to claims 14 and 37, Schanz teaches the system and method of claims 1 and 24. Schanz is silent to the fact that the print characteristic comprises a representation of a percentage of a determined deposit coverage as compared to an expected deposit coverage. MacFarlane et al. teach wherein the print characteristic comprises a representation of a percentage of a determined deposit coverage as compared to an expected deposit coverage. (MacFarlane et al., Column 13 Line 16 – Column 14 Line 13) It would have been obvious to one of ordinary skill in the art to modify the teachings of Schanz with the teachings of MacFarlane et al. This modification would have been prompted in order to determine if an area of the workpiece contains enough deposit thereon to pass inspection.
- With regards to claims 15 and 38, Schanz in view of MacFarlane et al. teach the system and method of claims 14 and 37. Schanz fails to teach wherein the print characteristic is provided as a representation for all deposits. MacFarlane et al. teach wherein the print characteristic is

provided as a representation for all deposits. (MacFarlane et al., Column 13 Line 16 – Column 14 Line 13)

- With regards to claims 16 and 39, Schanz in view of MacFarlane et al. teach the system and method of claims 15 and 38. Schanz fails to teach wherein the representation is of a worst case deposit. MacFarlane et al. teach wherein the representation is of a worst case deposit. MacFarlane et al., Column 13 Line 16 – Column 14 Line 13, specifically Column 13 Lines 26 - 34)
- With regards to claims 17 and 40, Schanz in view of MacFarlane et al. teach the system and method of claims 11 and 34. Schanz fails to teach wherein the print characteristic comprises a representation of a percentage of a determined deposit coverage as compared to an expected deposit coverage, and the print characteristic is provided as a plurality of representations for the inspection sites. MacFarlane et al. teach wherein the print characteristic comprises a representation of a percentage of a determined deposit coverage as compared to an expected deposit coverage, (MacFarlane et al., Column 13 Line 16 – Column 14 Line 13) and the print characteristic is provided as a plurality of representations for the inspection sites. (MacFarlane et al., Column 13 Line 16 – Column 14 Line 13)

- With regards to claims 18 and 41, Schanz in view of MacFarlane et al. teach the system and method of claims 17 and 40. Schanz fails to teach wherein the representation for each inspection site is of a worst case deposit in the respective inspection site. MacFarlane et al. teach wherein the representation is of a worst case deposit in the respective inspection site. (MacFarlane et al., Column 13 Line 16 – Column 14 Line 13, specifically Column 13 Lines 26 – 34, the worst case is if even one pixel is off)

- With regards to claims 19 and 42, Schanz in view of MacFarlane et al. teach the system and method of claims 17 and 40. Schanz fails to teach wherein the representation for each inspection site comprises a plurality of representations corresponding to at least ones or groups of ones of the deposits in the respective inspection site. MacFarlane et al. teach wherein the representation for each inspection site comprises a plurality of representations corresponding to at least ones or groups of ones of the deposits in the respective inspection site. (MacFarlane et al., Column 12 Line 39 – Column 13 Line 14, MacFarlane et al. describe a variety of different representations depending on the type and/or position of PWB being inspected)

- With regards to claims 20 and 43, Schanz teaches the system and method of claims 1 and 24. Schanz fails to teach wherein the points determined to be of deposit are determined by reference to a reference threshold value of image intensity. MacFarlane et al. teach wherein the points determined to be of deposit are determined by reference to a reference threshold value of image intensity. (MacFarlane et al., Column 4 Lines 46 – 64) It would have been obvious to one of ordinary skill in the art to modify the teachings of Schanz with the teachings of MacFarlane et al. This modification would have been prompted in order to decrease the amount of computational power required to compare reference and instant images.
- With regards to claims 21 and 44, Schanz in view of MacFarlane et al. teach the system and method of claims 20 and 43. Schanz fails to teach wherein, for at least one of the apertures, the points determined to be of deposit are determined as having an image intensity one of above or below a reference threshold value of image intensity. MacFarlane et al. teach wherein, for at least one of the apertures, the points determined to be of deposit are determined as having an image intensity one of above or below a reference threshold value of image intensity. (MacFarlane et al., Column 4 Lines 46 – 64, Column 6 Line 44—Column 7 Line 39)

- With regards to claims 22 and 45, Schanz in view of MacFarlane et al. teach the system and method of claims 20 and 43. Schanz fails to teach, wherein, for at least one of the apertures, the points determined to be of deposit are determined as having an image intensity within upper and lower bounding limits of a reference threshold value of image intensity. MacFarlane et al. teach wherein, for at least one of the apertures, the points determined to be of deposit are determined as having an image intensity within upper and lower bounding limits of a reference threshold value of image intensity. (MacFarlane et al., Column 4 Lines 46 – 64, Column 6 Line 44—Column 7 Line 39)

Allowable Subject Matter

7. Claims 8 and 31 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- Ehrichs U.S. Patent No. 6,522,776; which is directed towards a method for automated determination of reticle tile in a lithographic system.

- Koljonen et al. U.S. Patent No. 6,574,358; which is directed towards an automatic training of inspection sites for paste inspection.
- Prince U.S. Patent No. 6,738,505; which is directed towards a method and apparatus for detecting solder paste deposits on substrates.
- Wagman U.S. Patent No. 6,606,402; which is directed towards a system and method for in-line inspection of stencil aperture blockage.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ERIC RUSH whose telephone number is (571)270-3017. The examiner can normally be reached on 7:30AM - 5:00PM (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Samir Ahmed can be reached on (571) 272-7413. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Application/Control Number:
10/561,495
Art Unit: 2624

Page 16

ER

/Samir A. Ahmed/

Supervisory Patent Examiner, Art Unit 2624